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January 5, 2004

TO (FIRM): United States Patent And Trademark Office, Group Art Unit: 1745
ATTN: Examiner Raymond Alejandro

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FROM: James G. McEwen *JG*

Re: U.S. Patent Application
Serial No.: 10/072,907
For: LITHIUM-SULFUR BATTERIES
Inventors: Soo seek CHOI, et al.
Our Docket: 1567.1022

NO. OF PAGES (Including this Cover Sheet) *6 7*

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RESPONSE TO RESTRICTION REQUIREMENT

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By: *JG*
Date: *Jan 5 2004*

Docket No.: 1567.1022

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of:

Soo seek CHOI, et al.

Serial No. 10/072,907

Confirmation No. 3556

Filed: February 12, 2002

For: LITHIUM-SULFUR BATTERIES

Group Art Unit: 1745

Examiner: Raymond Alejandro

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RESPONSE TO RESTRICTION REQUIREMENTCommissioner for Patents
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Sir:

This is responsive to the Office Action mailed December 3, 2003, having a shortened period for response set to expire on January 5, 2004 (January 3 being a Saturday), the following remarks are provided.

I. Provisional Election of Claims Pursuant to 37 CFR §1.142

Applicants again provisionally elect Group I, claims 1-17, 38, and 39 in response to the preliminary restriction requirement set forth in the Office Action.

Applicants further provisionally elect Species 3, which the Examiner characterizes as being drawn to the Species of Example 3. The Examiner asserts that claim 1, at least, is generic to the Species 1 through 5 as defined by the Examiner. As the Examiner has not set forth which claims are drawn to Example 3 and in reviewing the elected claims, it is respectfully believed that claims 1-8 are generic to Species 1 through 5, and claims 1-9 are generic to Species 2 through 5, and claims 1-17 are generic to Species 3 through 5. As such, it is believed that claims 1-17 are included in Species 3.

II. Applicants Traverse the RequirementA. Group I and II

Insofar as Groups I and II are concerned, it is again believed that claims 18-28 of Group II are so closely related to elected claims 1-17, 38, and 39 of Group I that they should remain in the same application. The elected claims 1-17, 38, and 39 are directed to a lithium-sulfur

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battery, with at least depending claim 4 reciting the structure of the positive electrode provided by "mixing an elemental sulfur (S_8) powder, a conductive agent, and a binder to provide a positive active material slurry" and "coating the positive active material slurry on a current collector." Claims 18-28 are drawn to a method of preparing a positive electrode, where at least claim 18 recites "mixing an elemental sulfur (S_8) powder, a conductive agent, and a binder to provide a positive active material slurry; and coating the positive active material slurry on a current collector, wherein, during an electrochemical reaction, an active sulfur from the elemental sulfur powder is disposed in pores on the current collector, and the pores have an average size of up to 20 μm and are both electron-conductive and ion-conductive."

There remain no references cited to show any necessity for requiring restriction and, in fact, it is believed that the Examiner would find references containing both method and product claims in the same field of technology. While it is noted that the Examiner has identified different classifications for the product and method claims, it is believed that classification is not conclusive on the question of restriction. It is believed, moreover, that evaluation of both sets of claims would not provide an undue burden upon the Examiner at this time in comparison with the additional expense and delay to Applicants in having to protect the additional subject matter recited by the Group II claims by filing a divisional application.

MPEP §803 sets forth the criteria for restriction between patentably distinct inventions. (A) indicates that the inventions must be independent (see MPEP §802.01, §806.04, §808.01) or distinct as claimed (see MPEP §806.05-806.05(i)); and (B) indicates that there must be a serious burden on the Examiner if restriction is required (see MPEP §803.02, §806.04(a)-§806.04(i), §808.01(a) and §808.02). As such, beyond showing separate classifications, it is respectfully submitted that the Examiner has not set forth sufficient evidence to show that the Examiner will experience a serious burden in examining claims of Groups I and II, without imposing restriction, which is out of proportion with the serious burden and inconvenience visited upon the applicant if restriction is required. Therefore, it is respectfully submitted that the Examiner has not provided sufficient evidence of an undue burden on the Examiner to maintain a restriction requirement as between the claims of Groups I and II.

B. Group I and III

As an initial point of clarification, the Examiner again asserts that claims 1-17, 38, and 39 of Group I are drawn to a lithium-sulfur battery which does not require the use of the specific positive electrode, whereas claims 29-37 of Group III are drawn to a positive electrode comprising a current collector. As evidence, the Examiner again asserts that the battery of

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claims 1-17, 38, and 39 recite a positive electrode that can include any electrochemically active material or that the positive electrode comprises the conductive agent and a binder themselves, or that the positive electrode comprises a substrate or a current collector. However, even assuming arguendo that the Examiner correct as to the features which may or may not be used with the lithium battery, the Examiner's assertions do not appear to accurately reflect the invention as claimed, and the admissions asserted by the Examiner have not been made and are not reflected in the claims.

By way of review, claim 1 recites a "lithium-sulfur battery comprising: a positive electrode having an electron-conductive path and an ion-conductive path and comprising: a positive active material including an active sulfur, and pores of an average size of up to 20 μm having both electron-conductive and ion-conductive properties, where the active sulfur is disposed in the pores during an electrochemical reaction of the lithium-sulfur battery; a negative electrode comprising a negative active material selected from the group consisting of a lithium metal, a lithium-containing alloy, materials which can reversibly intercalate/deintercalate lithium ions, or materials which can reversibly form a chemical compound with lithium; a separator interposed between said positive and negative electrodes; and an ion-conductive electrolyte." As such, claim 1 does not recite the limitations as set forth by the Examiner.

Further, at least claim 4 recites a "current collector," but does not recite a current collector or a substrate as set forth by the Examiner.

Moreover, claim 29 recites "a positive active material including an active sulfur; and a current collector coated with the positive active material and, during an electrochemical reaction of the lithium-sulfur battery, has pores of an average size of up to 20 μm in which the active sulfur is disposed and having both electron-conductive and ion-conductive properties, wherein the positive electrode has an electron-conductive path and an ion-conductive path."

As noted in MPEP 806.05(c), a combination and a subcombination may be different inventions where "it can be shown that a combination as *claimed*: (A) does not require the particulars of the subcombination as claimed for patentability (to show novelty and unobviousness), and (B) the subcombination can be shown to have utility either by itself or in other and different relations" (*italics added*). As such, the focus in determining whether the combination is different from a subcombination is based upon the claimed invention. As claim 1 recites the use of "a positive active material including an active sulfur, and pores of an average size of up to 20 μm having both electron-conductive and ion-conductive properties, where the active sulfur is disposed in the pores during an electrochemical reaction of the lithium-sulfur

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battery," and claim 29 recites "a positive active material including an active sulfur; and a current collector coated with the positive active material and, during an electrochemical reaction of the lithium-sulfur battery, has pores of an average size of up to 20 μm in which the active sulfur is disposed and having both electron-conductive and ion-conductive properties, wherein the positive electrode has an electron-conductive path and an ion-conductive path."

It is again respectfully submitted that the Examiner has not analyzed the invention of Group I to determine if, *as claimed*, the lithium sulfur battery having the recited positive electrode of Group I is separately usable from the invention of Group III, which the Examiner characterizes as being drawn to a positive electrode having an electrode chemical feature separately usable from the lithium sulfur battery having the positive electrode recited in claim 1. Therefore, it is respectfully submitted that the Examiner has not set forth sufficient evidence that the invention as claimed in claims 1-17, 38, and 39 is separately usable from the invention as claimed in claims 29-37 as is required to maintain a prima facie restriction requirement under the two way standard set forth for combination/sub-combinations in at least MPEP 806.05(c). Therefore, it is again respectfully requested that the Examiner reconsider and withdraw the restriction as between Groups I and III.

C. Non Elected Groups II and III

Insofar as Groups II and III are concerned, it is believed that claims 18-28 are so closely related to non-elected claims 29-37 that, should either Group II or Group III remain in the application, both Group II and Group III should remain in the same application. Moreover, while the Examiner asserts various "admissions" on page 3 of the Office Action, it is respectfully submitted that the "admissions" are not in correspondence with the invention as claimed. Specifically, claims 29-37 of Group III are directed to a positive electrode for use in a lithium-sulfur battery. In contrast and as also described above in Section A, claims 18-28 are drawn to a method of preparing a positive electrode, where at least claim 18 recites "mixing an elemental sulfur (S_8) powder, a conductive agent, and a binder to provide a positive active material slurry; and coating the positive active material slurry on a current collector, wherein, during an electrochemical reaction, an active sulfur from the elemental sulfur powder is disposed in pores on the current collector, and the pores have an average size of up to 20 μm and are both electron-conductive and ion-conductive."

There have again been no references cited to show any necessity for requiring restriction and, in fact, it is believed that the Examiner would find references containing both method and product claims in the same field of technology. While it is noted that the Examiner has identified

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different classifications for the product and method claims, it is again believed that classification is not conclusive on the question of restriction. It is believed, moreover, that evaluation of both sets of claims would not provide an undue burden upon the Examiner at this time in comparison with the additional expense and delay to Applicants in having to protect the additional subject matter recited by the Group III or Group II claims by filing a divisional application(s).

As such, beyond showing separate classifications, it is respectfully submitted that the Examiner has not set forth sufficient evidence to show that the Examiner will experience a serious burden without imposing restriction that is out of proportion with the serious burden and inconvenience visited upon the applicant if restriction is required.

D. Election as to Species

On pages 4-5, the Examiner asserts that applicants must elect between species drawn to Species of Examples 1 through Example 5. The Examiner asserts that at least claim 1 is generic to Species 1 through 5 as defined by the Examiner. As an initial point of clarification, claim 9 appears to be generic between Species 2 through 5 as defined by the Examiner. Additionally, at least claim 10 appears generic to Species 3 through 5 as defined by the Examiner.

Moreover, the Examiner has not provided evidence that the Examiner will experience an undue burden in searching and examining the invention set forth in Species 1 through 5. Specifically, the Examiner has not provided evidence that the existence of five species (as defined by the Examiner) represents an unreasonable number of species to be searched, and has not provided a rationale as to why the invention is to be separated into Species 1 through 5 after being previously separated into Species IA through IC, IIA, IIB, IIIA, and IIIB as set forth in a prior Office Action of October 1, 2003. In contrast and consistent with the requirements in MPEP 803 and 808, the Examiner needs to provide a rationale as to why an election is required or how, without the election, the Examiner is unduly burdened in comparison with the burden visited on the applicants in the extra delay and expense in obtaining protection for each Species. The Examiner has not provided such a rationale in the Office Action utilizing the factors set forth in MPEP 803.

As such, it is respectfully submitted that the Examiner has not presented sufficient evidence of a burden on the Examiner in examining Species 1 through 5 which is out of proportion with the delay and expense visited on the applicants in protecting the invention recited in Species 2 and 5 so as to show an undue burden on the Examiner sufficient to require an election between these species.

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As such, it is respectfully submitted that the Examiner has not provided sufficient evidence to maintain a prima facie requirement for an election between Species for the Group I through III claims.

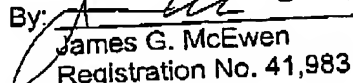
III. Conclusion

Upon review of references involved in this field of technology and when all of the other various facts are taken into consideration, it is believed that upon reconsideration of the Examiner's initial restriction requirement, all of the pending claims should be examined in the subject application.

Should any questions remain unresolved, the Examiner is requested to telephone Applicants' attorney.

Respectfully submitted,

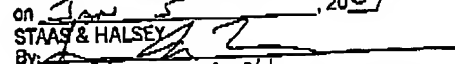
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Date: Jan 5, 2004

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